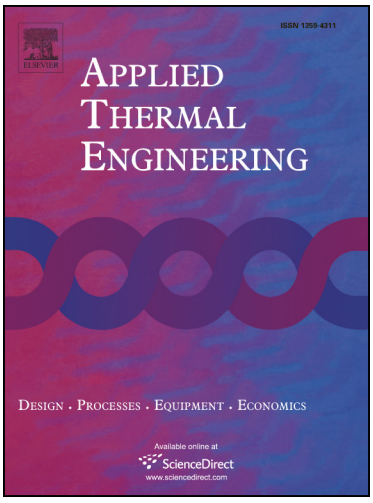

Research Paper

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Sourav Mitra, Mahbubul Muttakin, Kyaw Thu, Bidyut Baran Saha

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Study on the influence of adsorbent particle size and heat exchanger aspect ratio on dynamic adsorption characteristics

Sourav Mitra[1,2], Mahbubul Muttakin[1,4], Kyaw Thu[1,4] and Bidyut Baran Saha[1,3*]

[1]International Institute for Carbon-Neutral Energy Research (WPI-I[2]CNER), Kyushu University, 744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan

[2]Department of Mechanical Engineering, Indian Institute of Technology, Kharagpur 721302, India

[3]Mechanical Engineering Department, Kyushu University, 744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan

[4]Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Kasuga-koen 6-1, Kasuga-shi, Fukuoka 816-8580, Japan

[*]**Corresponding author:** Tel.: +81-92-802-6722

E-mail: saha.baran.bidyut.213@m.kyushu-u.ac.jp

Abstract

Adsorption heat exchanger comprises of the adsorbent granules/particles packed in between heat exchanging surfaces. The refrigerant vapor flow as well as heat transfer occurs through the adsorbent column. A 2-dimensional transient CFD study is employed to simulate the adsorption dynamics of ethanol vapor on loosely packed activated carbon. The adsorbent chosen for this study is activated carbon and the refrigerant is ethanol. In this paper, the efficacy of the refrigerant vapor transport through the porous adsorbent bed is studied in terms of flow resistance and thermal diffusion along with the mass diffusion through adsorbent particles. Three heat exchanging domains with same area but different aspect ratios (fin height to fin pitch ratio) along with two particle sizes are evaluated. The dynamic uptake predicted by this CFD study shows strong dependency on flow resistance of porous media for smaller particle size whereas a weak dependency on thermal and intra-particle mass diffusion is observed for larger particles. Furthermore, a comparison on the adsorption dynamics predicted by the present CFD study and